Modeling for wideband signal in Tesseral

- Test Case Study

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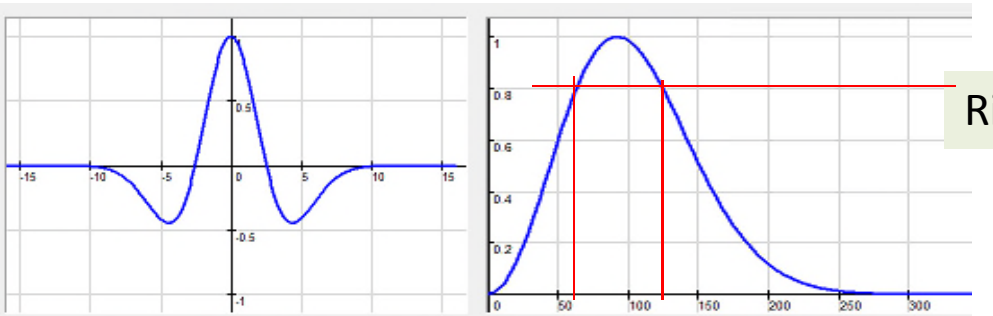
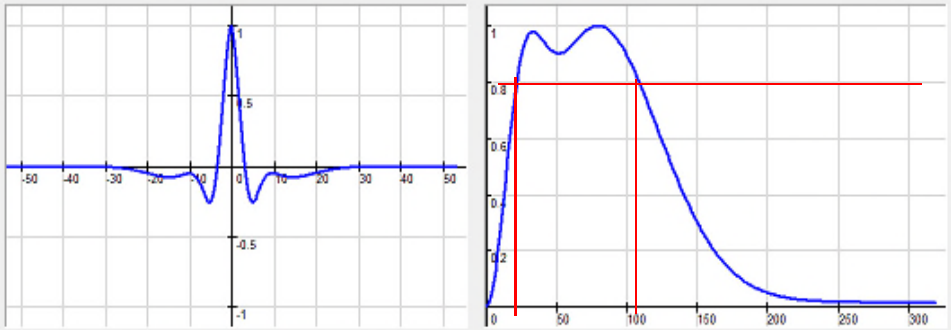


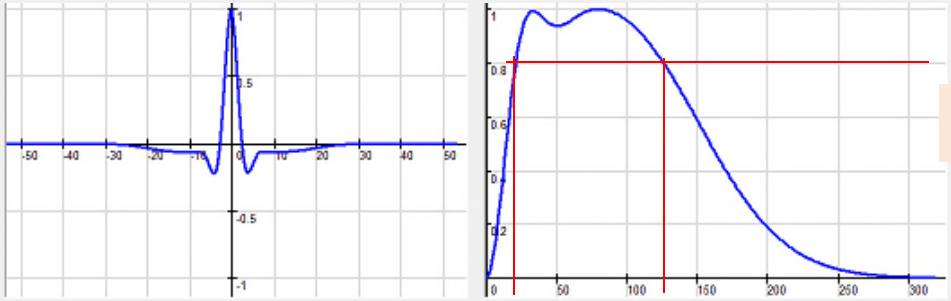
Rikker 90Hz



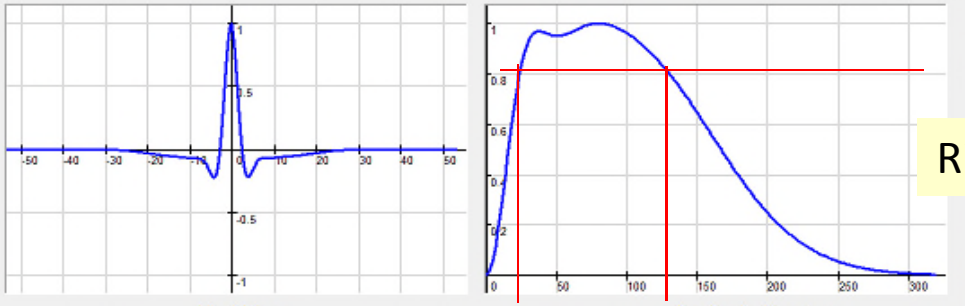
ikker 30x0.22-90x1-180x0.05 Hz

Real Time

Amplitude Spectrum



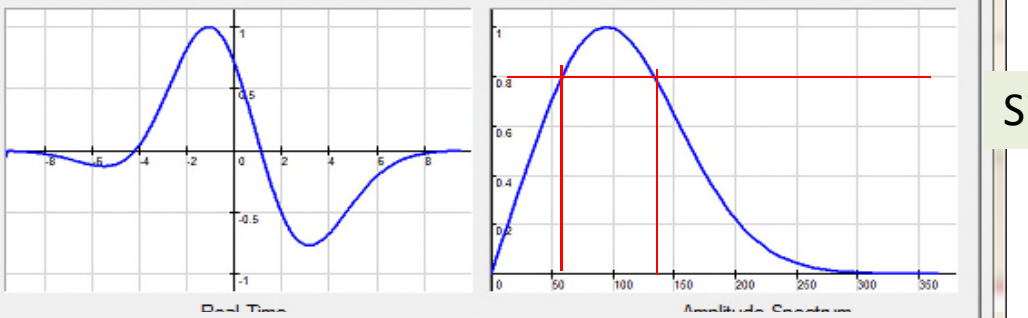
Rikker 30x0.2-60x0.24-90x0-120x1.2 Hz



Rikker 30x1-90x0.15-120x0.65-180x0 Hz

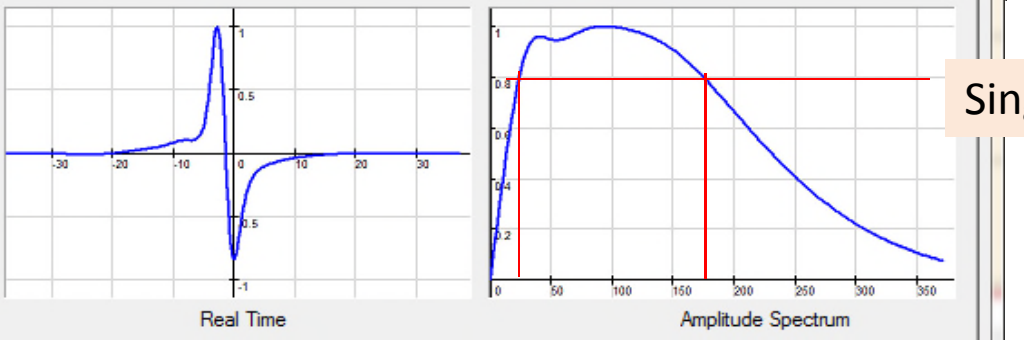
Real Time

Amplitude Spectrum

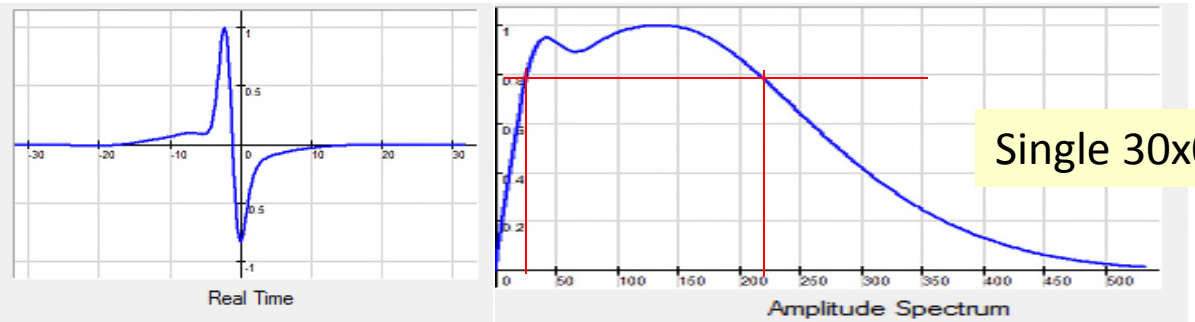


Single 100Hz

Single 30x0.09-60x0.23-120x0.7-180x1.5 Hz



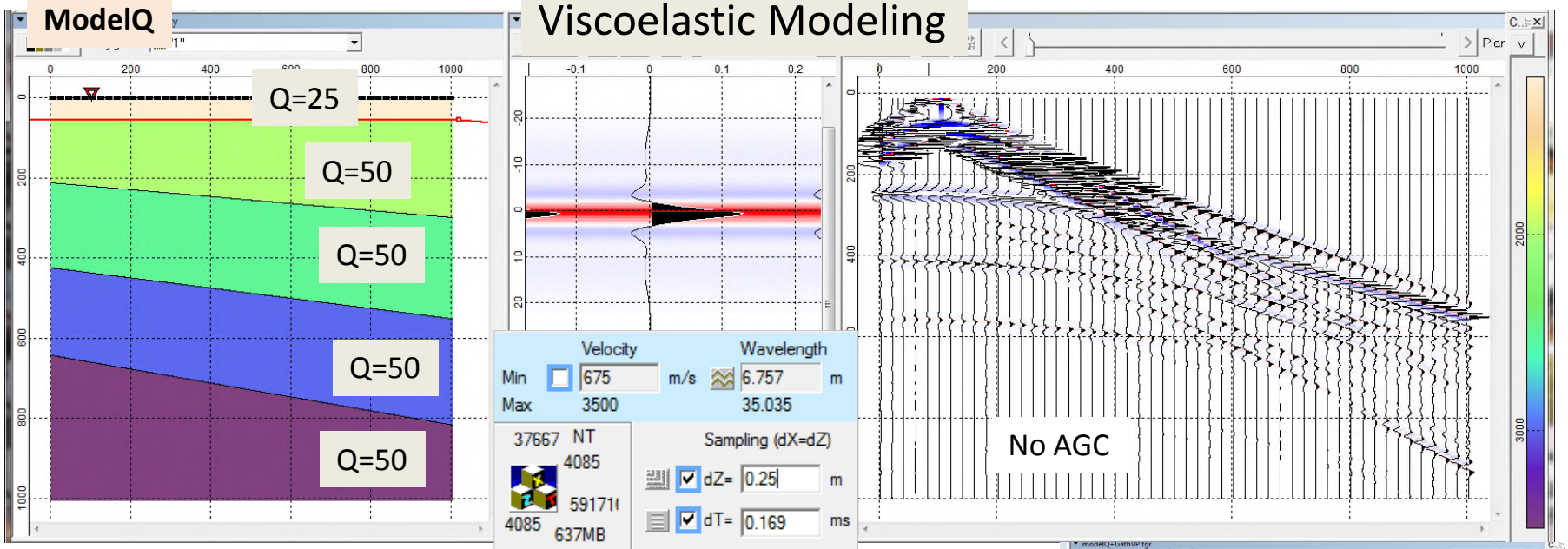
Single 30x0.15-60x0.2-120x0.7-180x1 Hz

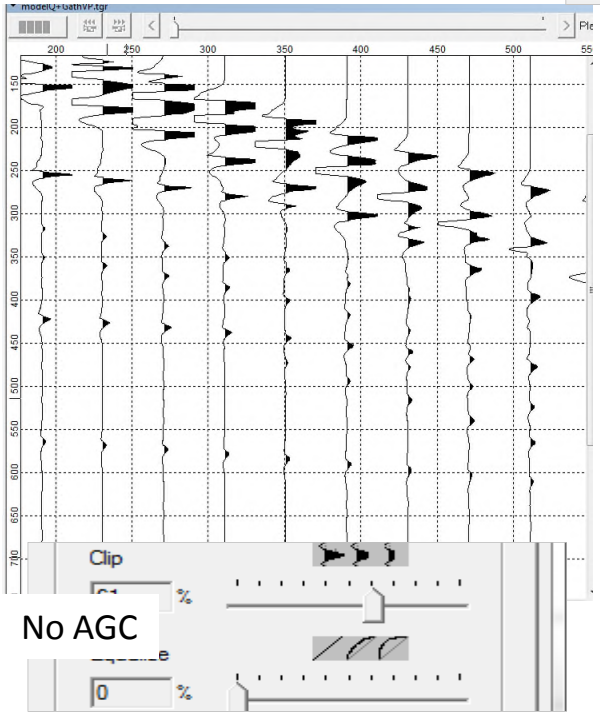


Single 30x0.25-60x0.25-120x1-180x2 Hz

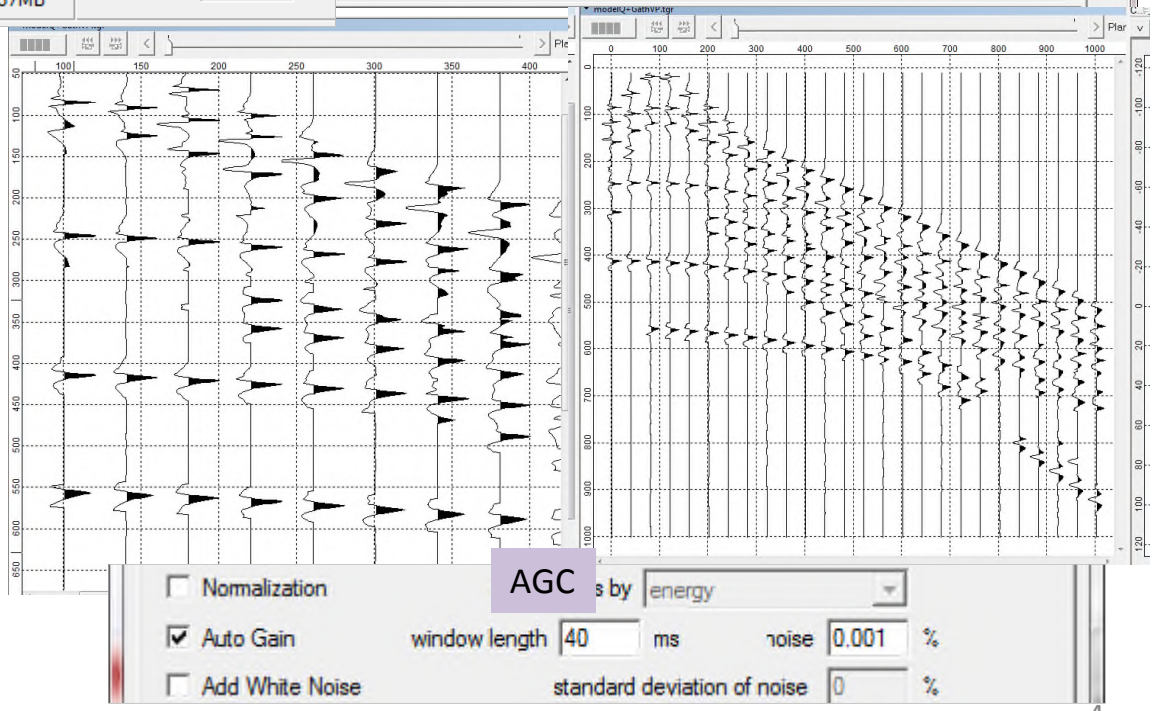
Viscoelastic Modeling

ModelQ

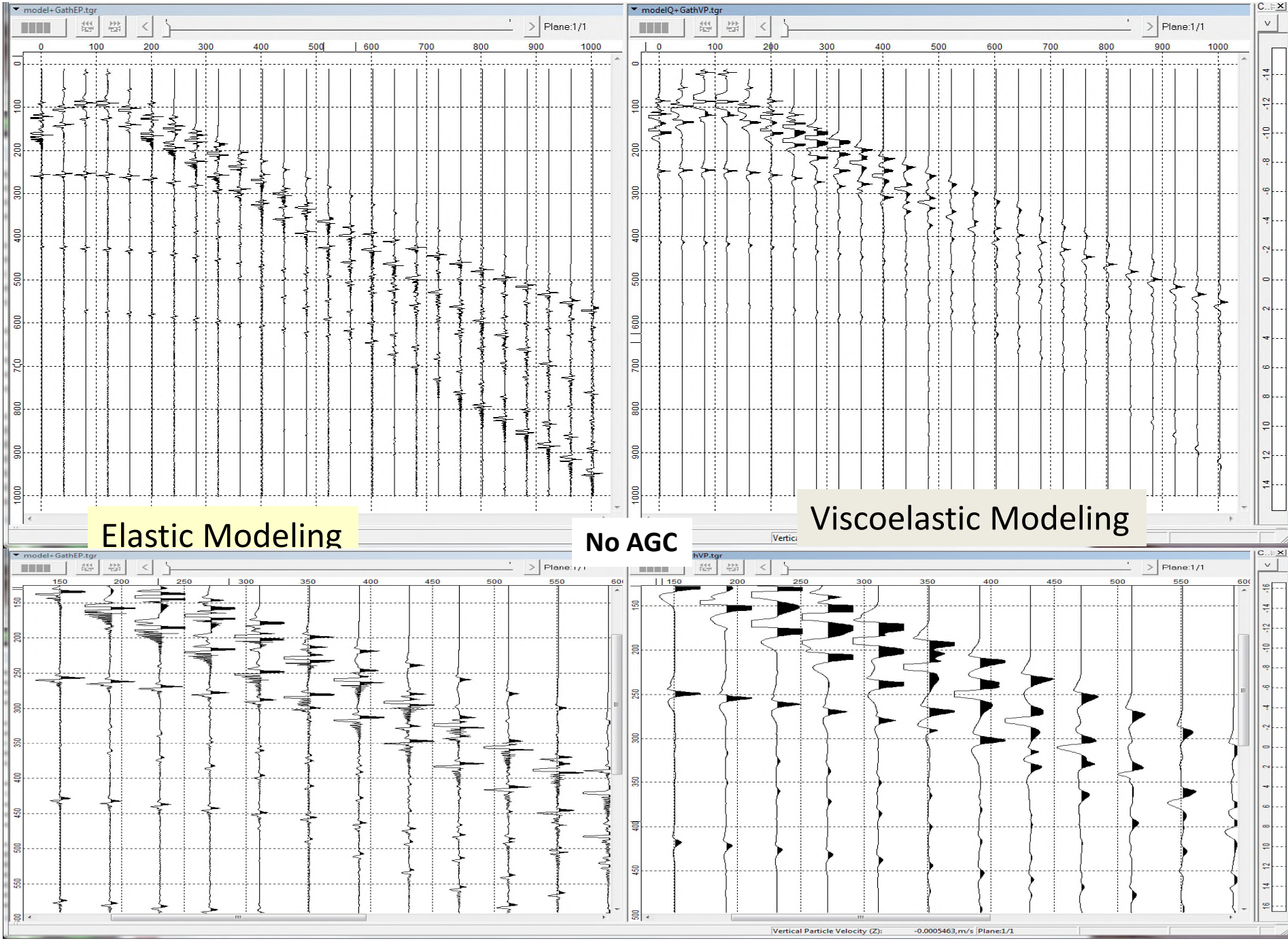




No AGC

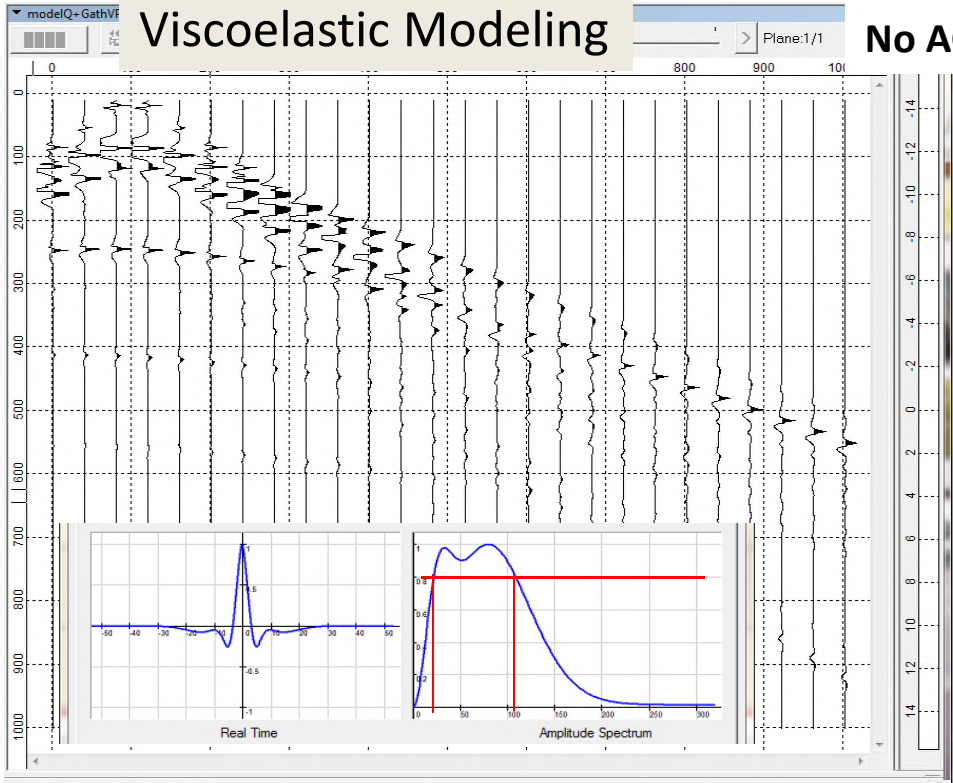


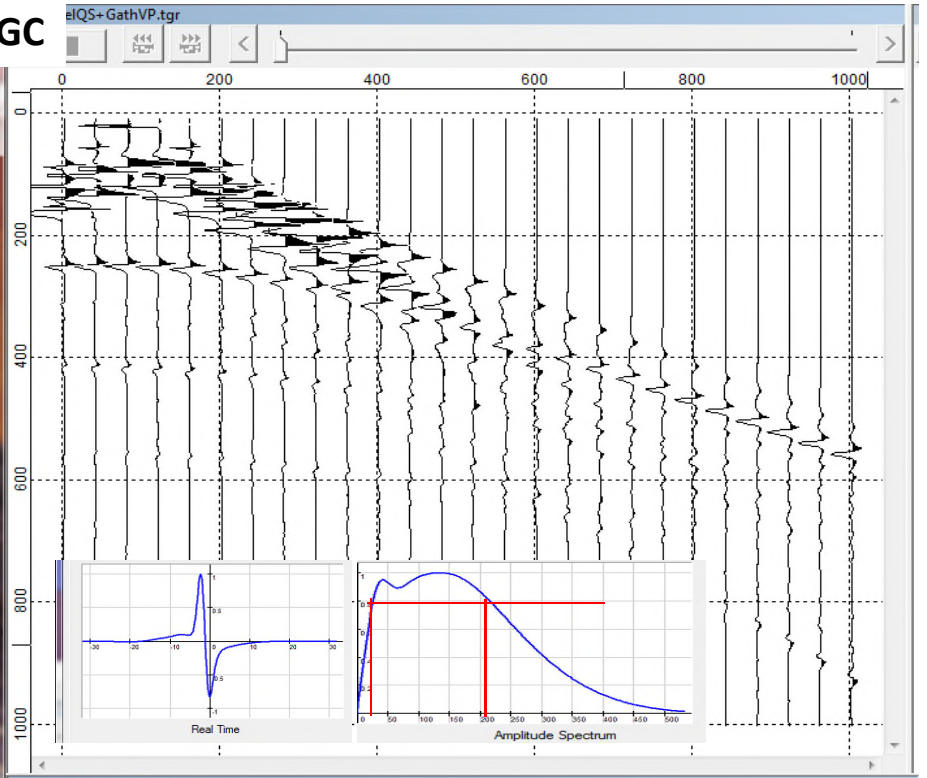
AGC

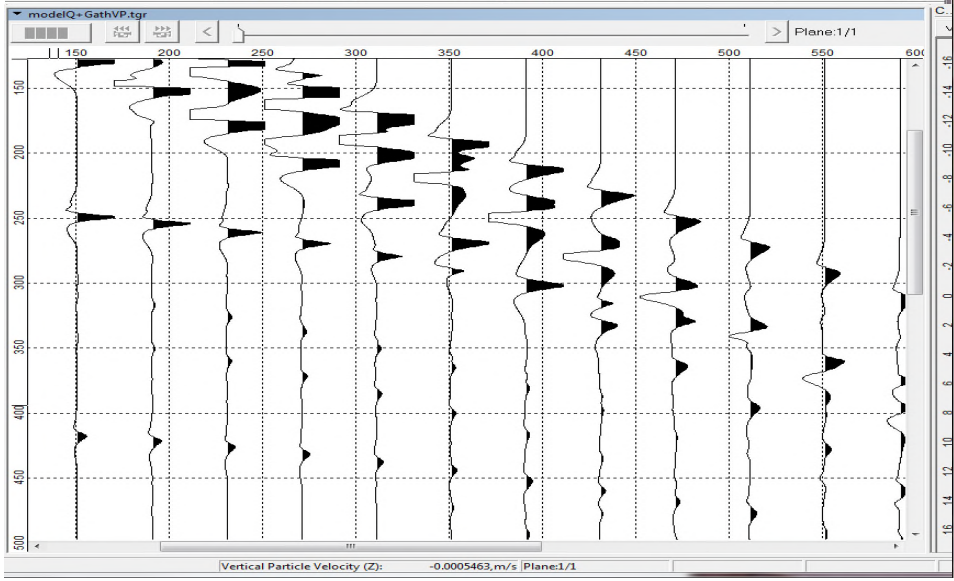

model+GathEP.tgr
Plane:1/1
modelQ+GathVP.tgr
Plane:1/1
Elastic Modeling
No AGC
Viscoelastic Modeling
Vertical Particle Velocity (Z):
-0.0005463,m/s
Plane:1/1

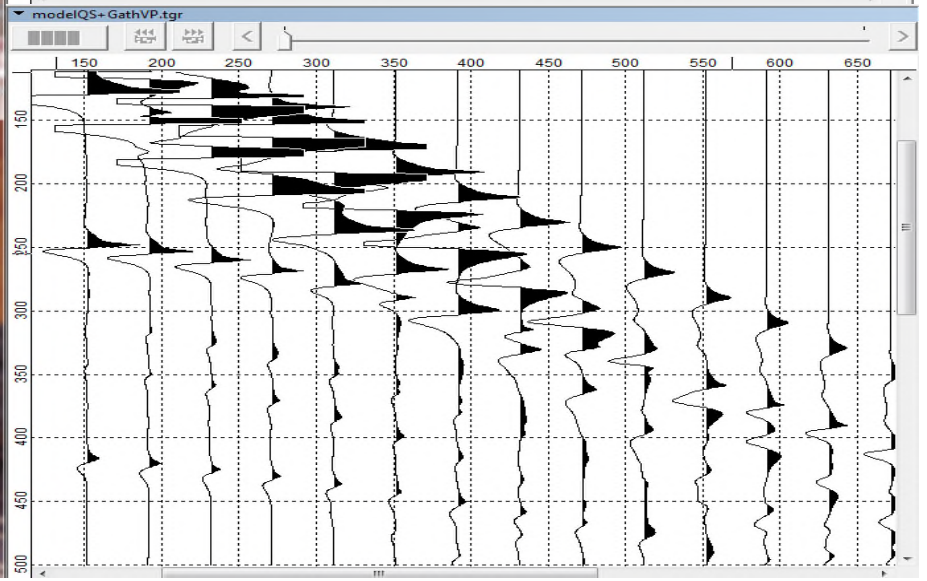
Viscoelastic Modeling

No AGC



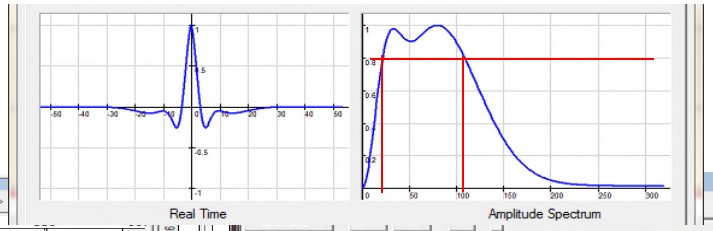




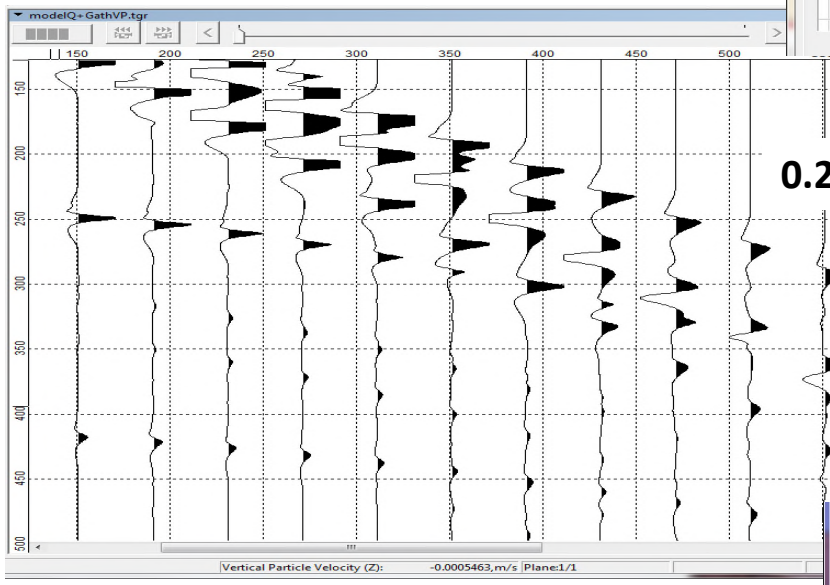


Viscoelastic Modeling

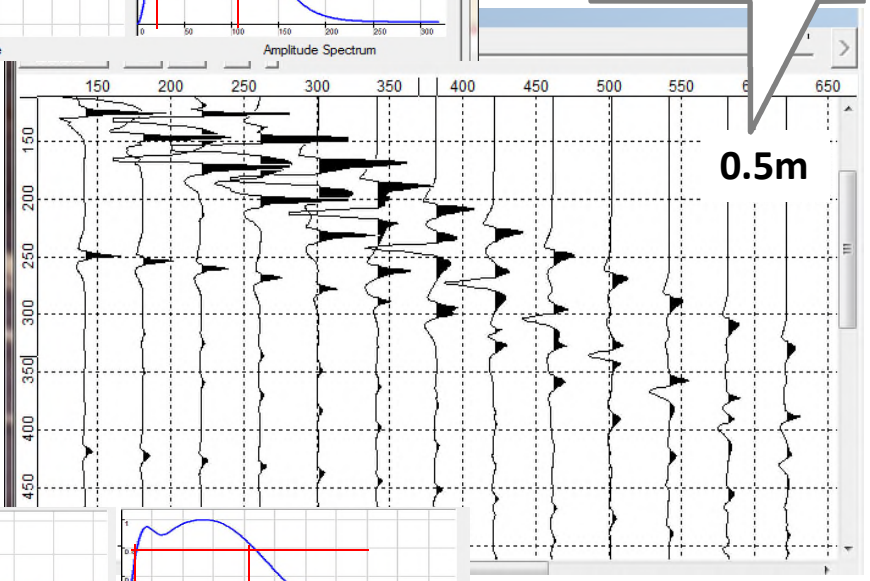
No AGC



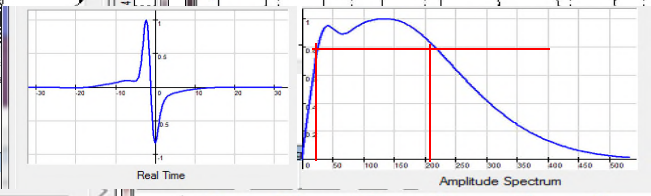
Computation Grid cell size

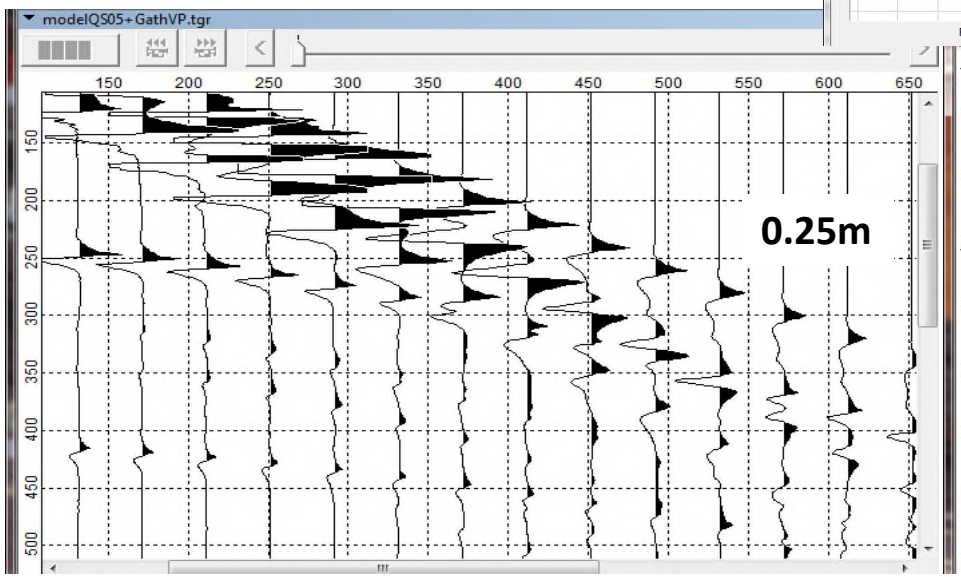


0.25m

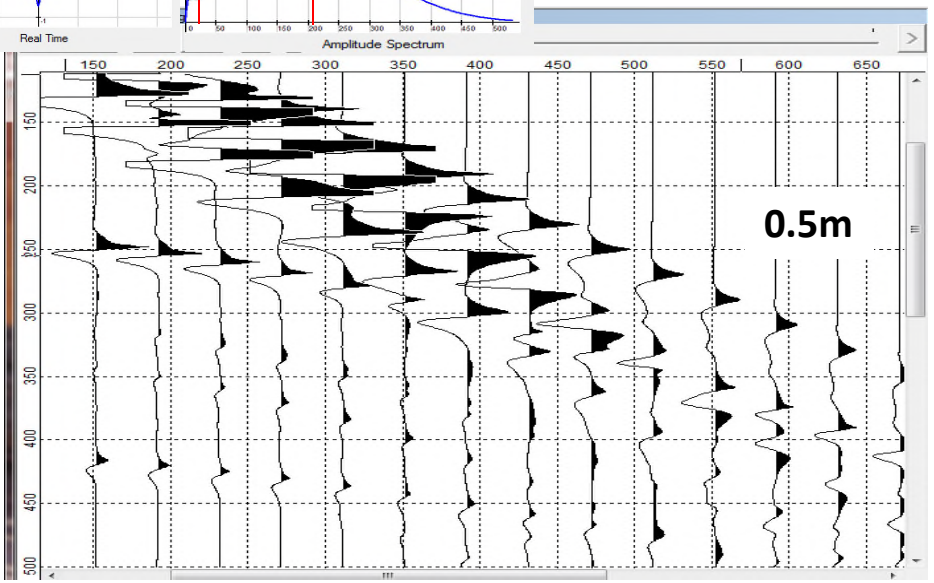


0.5m



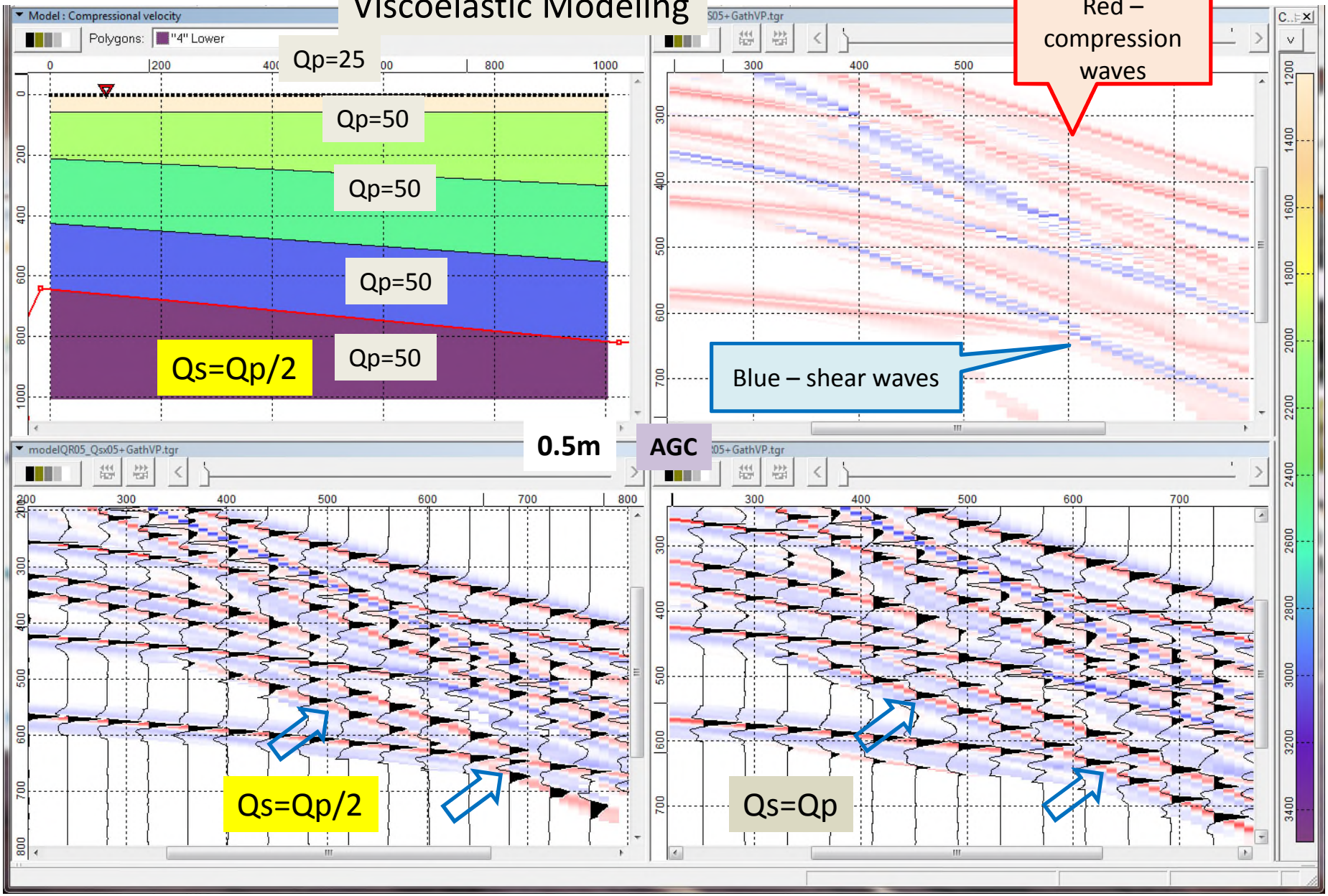


0.25m



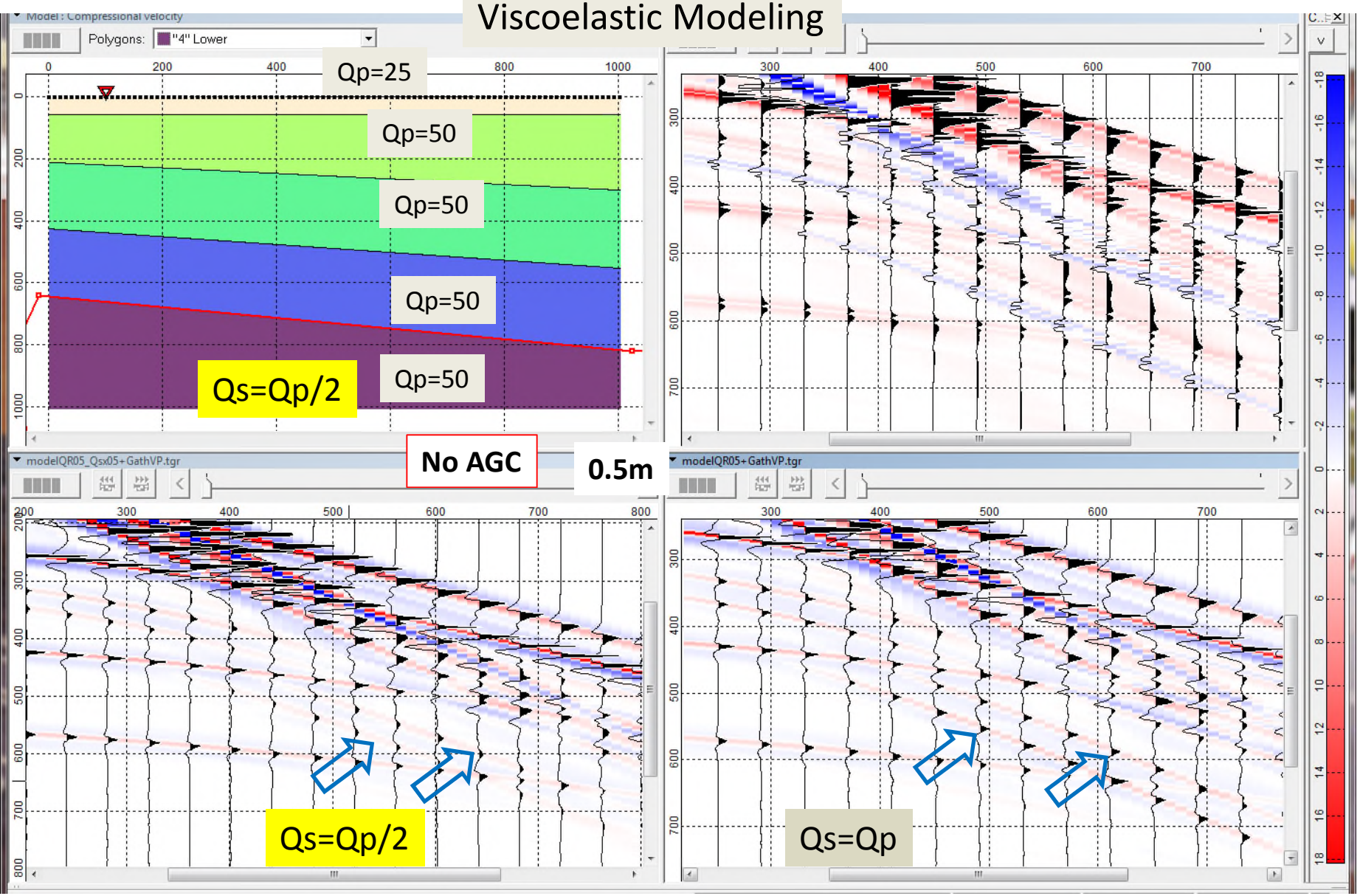
0.5m

Viscoelastic Modeling



Qp, Qs – attenuation for P- and S- waves. With arrows are shown incoming S-waves . Decrease of frequency content may be visually estimated as 25-50% for the model with Qs=Qp/2.

Viscoelastic Modeling



Same as previous slide. No AGC applied

Summary

- *Viscoelastic and Elastic modeling was done* for *composite wideband Rikker (20-110Hz) and Single (20-200 Hz) signals* with 0.25x0.25m grid cell size which should assure quality results for up to 250Hz frequency.
- *ModeQ* used for this test has *considerably lower absorption properties* (Q=25 in thin upper layer and Q=50 for the bulk of the medium) that can be expected in real geology conditions.
- Results on Slides 3-6 show that ***viscoelastic modeling is handling such kind of wavelets much better*** *than elastic* and is visually producing expected results – decreasing of the incoming events peak frequency with increasing of corresponding reflector depth and receiver offset.
- It may be concluded that ***Modeling for wideband wavelet has practical applicability only in viscoelastic case***.

It may be concluded that *in produced (viscoelastic) synthetic gathers*:

- amplitudes of incoming events considerably depend on absorbing properties (even “very low absorbing”) of the modeled medium. Before using them in *conventional and DWM processing AGC corrections must be applied*;
- Modeling with different for P- and S-waves absorbing Q-factors show expected decrease in the frequency in the incoming events frequency content with decrease of corresponding Q.
- to properly handle and interpret changes in the frequency band of incoming events *in Tesseral package must be done additional development* addressing those issues: *wavelet and signal setting* (/Signal dialog) *and processing*, like: *band filter, deconvolution, upgraded AGC, etc.*
- must be done (already planned) *upgrade of viscoelastic modeling to properly handle medium model based on seismic frequency velocities* (presently – model velocities are treated as relating to 0-frequecy, and are lower than ones derived from seismic frequencies)).